Issues in International Finance

Exchange rates in the long run: Monetary models

[part 2]

UW – Madison // Fall 2018

Roadmap

- Where we have been
  - Asset price (interest rate) parity conditions
  - Goods price parity conditions (PPP)
  - Quantity theory of money + PPP $\rightarrow$ inflation rates & fx rates
- Currently: Exchange rates in the **long run**
  - Quantity theory with interest-sensitive money demand
  - Real interest parity (CIP & UIP are nominal interest conditions)
  - A first look at central bank policy targets
- Coming up: Exchange rates in the **short run**
  - Read: *Exchange Rates II* (Chapter 15 or Chapter 4)

Quantity theory with interest-sensitive liquidity demand

- Our original model

$$M^d = \bar{L}PY$$

- New model

$$M^d = L(i)PY$$

- $L(i)$ is a decreasing function of the nominal interest rate i
  - Money has a nominal interest rate of zero
  - Bonds, savings, etc has an interest rate of i
  - Opportunity cost of money is i

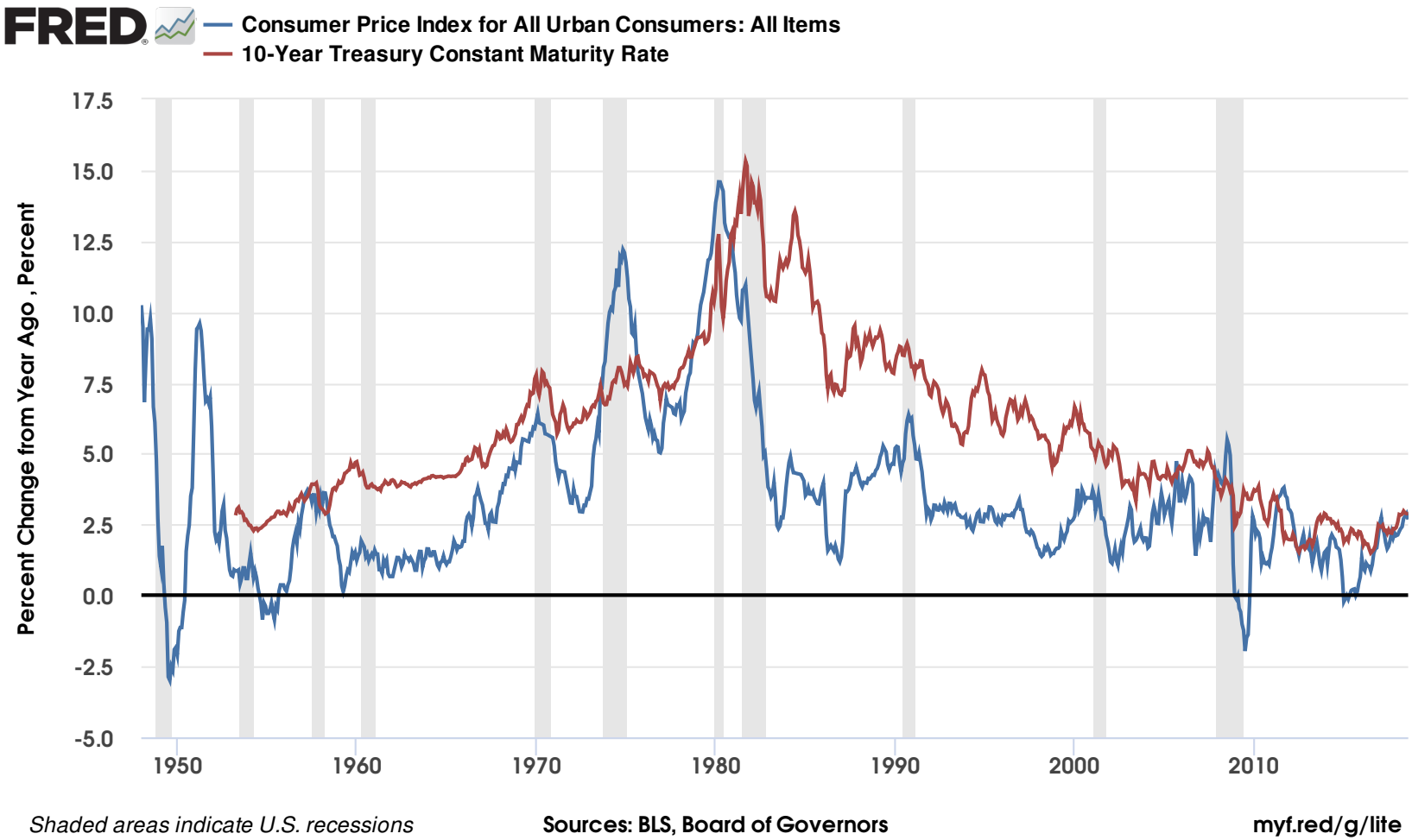
- Let's get a handle on interest rates and then work through this model

Nominal and real interest rates

- What is the difference between real and nominal interest rates?
- Nominal interest rate (i) is the return to saving (or cost of borrowing) in terms of **money**. If $i = 6\%$ per year, a one-year loan returns 6% more dollars.
- Real interest rate (r) is the return to saving (or cost of borrowing) in terms of **purchasing power**. If $r = 4\%$ per year, a one-year loan returns 2% more consumption.
- The difference between the two is expected inflation: π^e

$$i_t = \pi_t^e + r_t$$

Evidence for the Fisher effect



Nominal and real interest rates

- Suppose $i_t = 6\%$ and $\pi_t^e = 2\% \rightarrow r_t = 2\%$

$$i_t = \pi_t^e + r_t$$

- $\pi_t^e = 2\%$ is an expectation. What if inflation turns out to be 3%?
- Unexpected inflation is good for borrowers and bad for lenders
- Inflation uncertainty makes borrowing and lending risky and less common
- Keeping inflation predictable is an important goal for central banks

"maximum employment, stable prices"

Nominal interest rate

- We now need to know about the nominal interest rate: i
- To do so, we combine PPP with UIP
- UIP is

$$d^e_{\frac{\$}{€}} = i^e_{\$} - i^e_{€}$$

- UIP is about expected depreciation. We can write PPP in expectation, too.

$$d^e_{\frac{\$}{€}} = \pi^e_{us} - \pi^e_{eu}$$

- PPP is no-arbitrage in good markets. UIP is no-arbitrage in asset markets. **They should both be correct in the long run.** Set the two equal:

$$i^e_{\$} - i^e_{€} = \pi^e_{us} - \pi^e_{eu}$$

Real interest parity

- Rearrange this to form

$$i^e_{\$} - i^e_{€} = \pi^e_{us} - \pi^e_{eu}$$

$$i^e_{\$} - \pi^e_{us} = i^e_{€} - \pi^e_{eu}$$

$$r^e_{us} = r^e_{eu}$$

- Wow. PPP + UIP $\Rightarrow$ real interest parity
- "Globalization" (trading assets and goods) leads to convergence in real interest rates across countries. [when prices are flexible]
- This is true for any country-pair in the open economy.

$$r^e_{us} = r^e_{uk} = r^e_{fr} = r^e_{jn} = r^e_{in} = \cdots = r^*$$

- r^* is the world interest rate which is exogenous to any one country

The Fisher effect

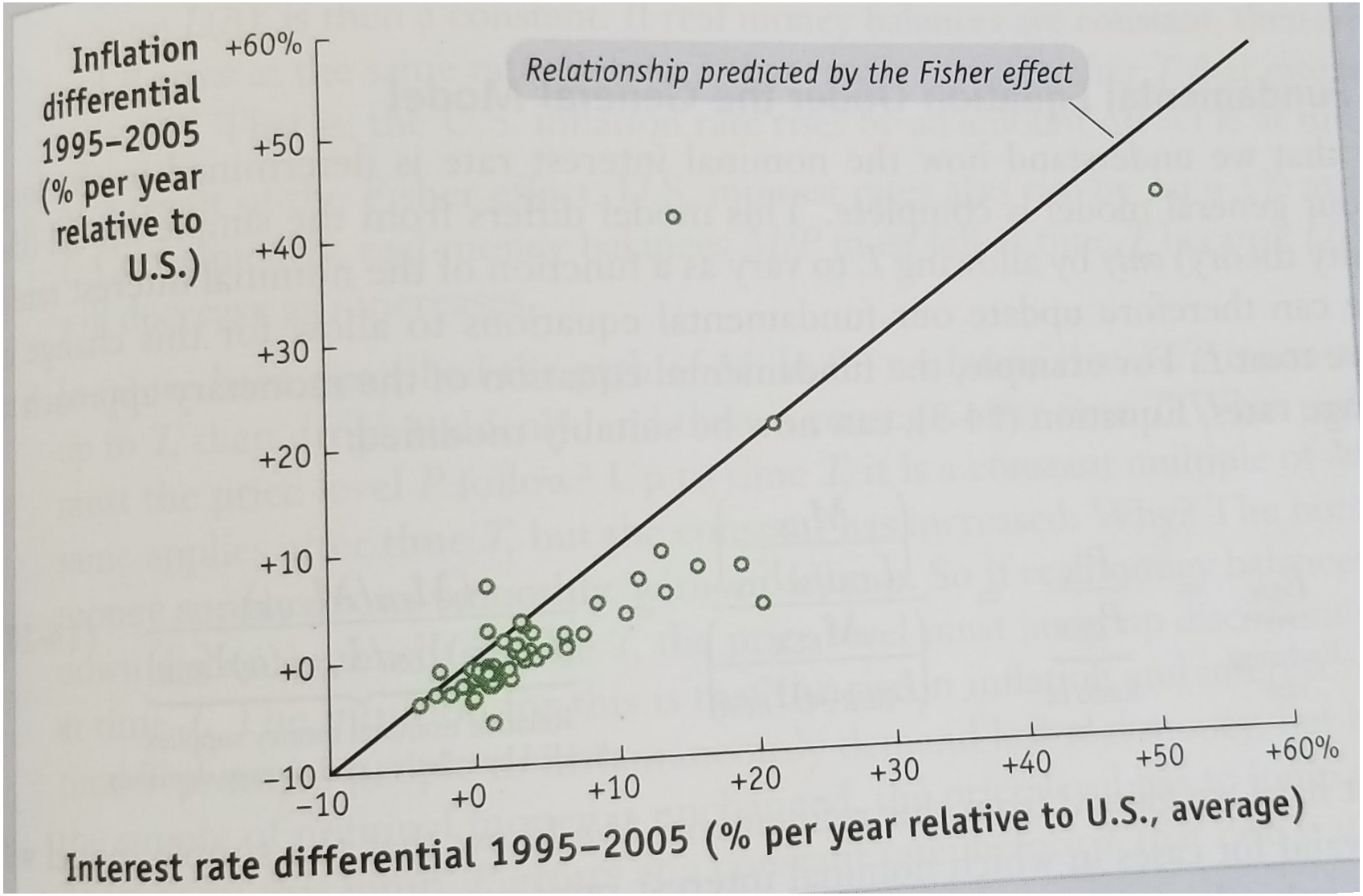
- If r is the same across countries, then i is

$$i_{\$} = \pi^{e}_{us} + r^{*}$$

$$i_{€} = \pi^{e}_{eu} + r^{*}$$

- Differences in nominal interest rates reflect differences in inflation

Evidence for the Fisher effect



Quantity theory with interest-sensitive liquidity demand

- New model

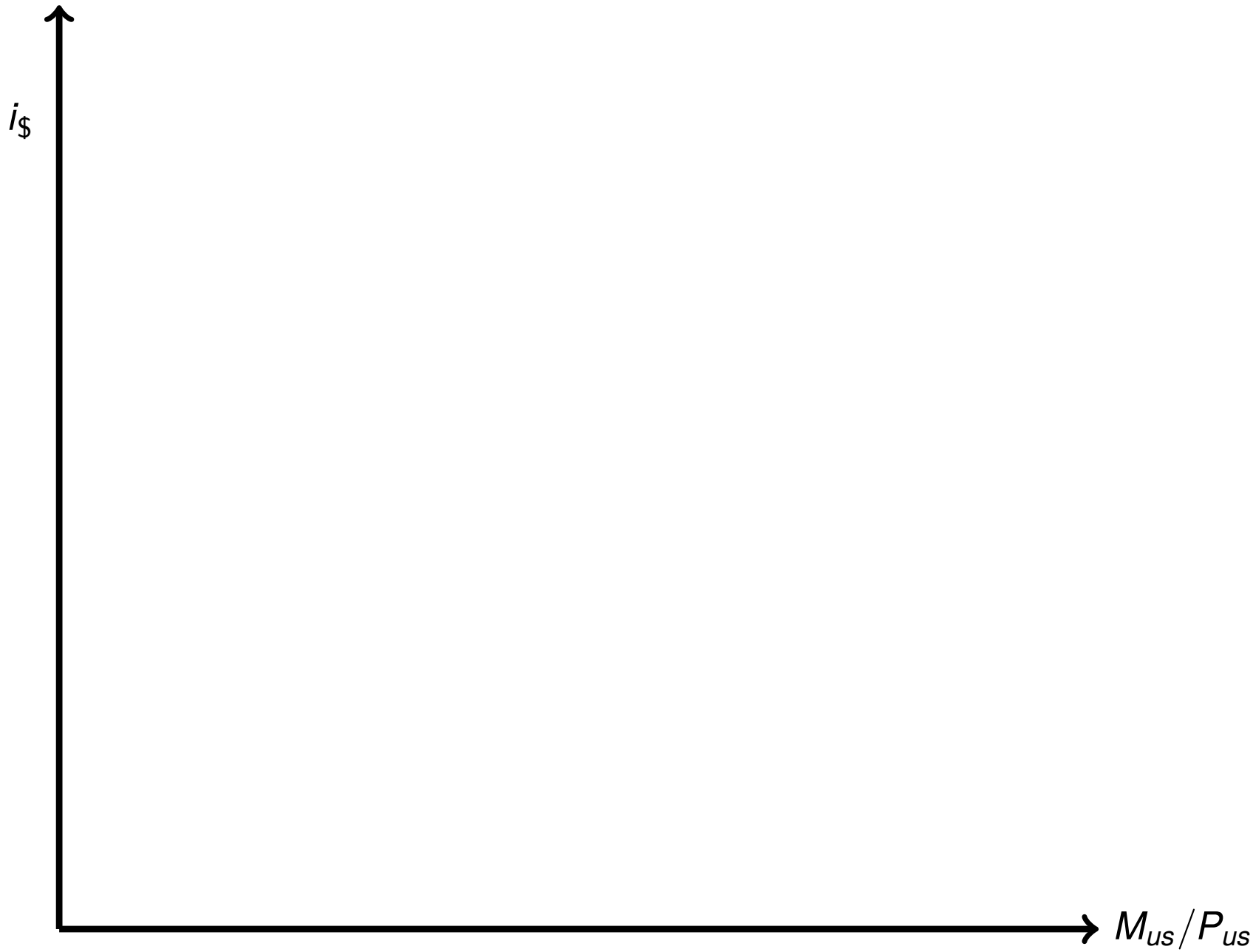
$$M^d = L(i)PY$$

- $L(i)$ is a decreasing function of the nominal interest rate i
  - Money has a nominal interest rate of zero
  - Bonds, savings, etc has an interest rate of i
  - Opportunity cost of money is i
- Demand for real balances

$$\frac{M^d}{P} = L(i)Y$$

- Even if Y is constant, demand for real balances moves when i moves

Real money demand and the nominal interest rate



Quantity theory with interest-sensitive liquidity demand

- As before, use PPP and quantity theory

$$E_{\frac{\$}{£}} = \frac{\frac{M_{us}}{L(i)_{us}Y_{us}}}{\frac{M_{uk}}{L(i)_{uk}Y_{uk}}} = \frac{M_{us}/M_{uk}}{L(i)_{us}Y_{us}/L(i)_{uk}Y_{uk}}$$

- Let λ be the growth rate of $L(i)$.

$$(\mu_{us,t} - \mu_{uk,t}) - (g_{us,t} - g_{uk,t}) - (\lambda_{us,t} - \lambda_{uk,t}) = d_{\frac{\$}{£},t}$$

- In the old model, $\lambda = 0$ always.
- In the new model, $\lambda = 0$ when i is constant. If i increases, $\lambda < 0$.

The effects of money growth

- Let $g_{us} = g_{uk} = 0$ and all variables in UK unchanged
- If μ_{us} is constant, what is happening to
  1. Real money balances?
  2. Interest rates?
  3. Prices?
  4. Exchange rates?

Model with constant liquidity demand $\bar{L}$

Model with variable liquidity demand $L(i)$

The effects of money growth

- Let $g_{us} = g_{uk} = 0$ and all variables in UK unchanged
- At time T, μ_{us} **unexpectedly** increases to $\mu_{us} + \Delta\mu$ where it will stay **permanently**
- Assumption: As soon as μ changes, everyone knows it so expectations adjust instantly
- What is happening to
  1. Real money balances?
  2. Interest rates
  3. Prices?
  4. Exchange rates?

Expectations

- The model with $L(i)$ generates more volatile inflation and exchange rates
- This is the result of a **change in expectations**
  1. At T learn that **future** inflation will be higher
  2. Foresee depreciation of the dollar in the **future** (by PPP)
  3. Sell dollars for euros **now**
  4. Dollar depreciates, even though nothing has changed yet

- An example of how spot exchange rates (and other prices) can be very volatile: they are constantly responding to changes in expectations

Central bank policy targets

- People like predictable and stable inflation
- We just saw that changes in expectations cause volatile inflation
- How does a central bank convince people it won't do anything crazy in the long run?
- One way: Have a great reputation (the Fed, ECB)
- Another way: Nominal anchors (i.e., a constraint or rule)
  1. Exchange rate target
  2. Money supply target
  3. Inflation target

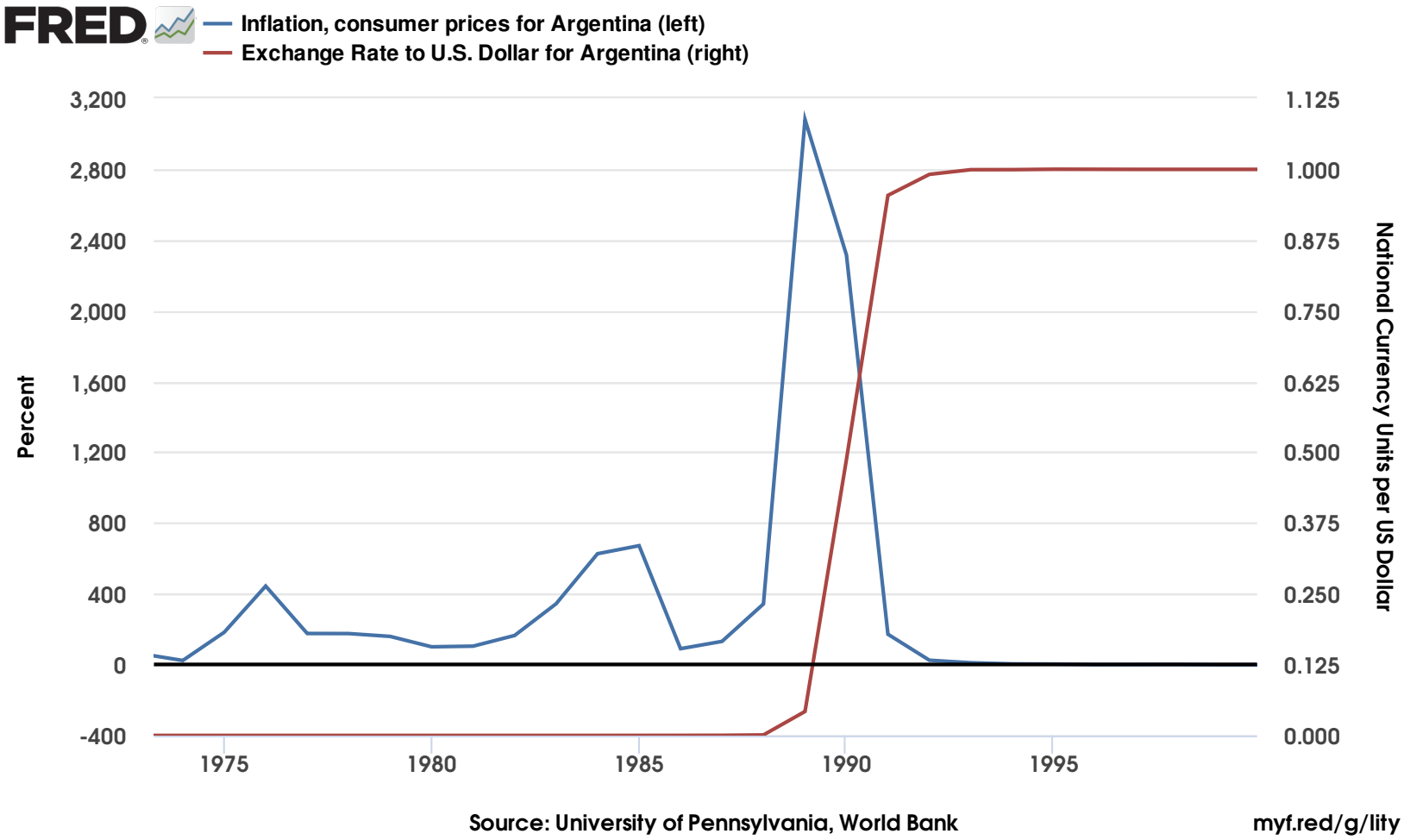
Exchange rate target

- From RPPP

$$\pi_H = d_{H/F} + \pi_F$$

- Make a rule about $d_{H/F}$. Set policy to make sure the target is met.
- An advantage of this is that $d_{H/F}$ is easy to see
- Most extreme: $d_{H/F} = 0$
- This is what Argentina did to stop a hyperinflation

Inflation and the exchange rate in Argentina



Money supply target

- From the quantity theory

$$\pi_H = \mu_H - g_H - \lambda_H$$

- Make a rule about μ_H. Set policy to make sure the target is met.
- A disadvantage of this is that g_H and λ_H move around, so π_H may not be very stable — defeating the purpose of the target
- Most central banks abandoned this kind of target

Inflation target

- From Fisher equation

$$\pi_H^e = i_H - r^*$$

- Make a rule about π_H. Adjust i_H to make sure the target is met.
- r^* is roughly constant
- Central bank has good control over $i_H \Rightarrow$ good control over π_H
- Many central banks do this
  - Explicitly (New Zealand)
  - Implicitly (Fed)

Summary

- PPP + UIP $\Rightarrow$ real interest parity
  - Inflation differences lead to nominal interest rate differences
- Allow for interest-sensitive liquidity demand in quantity theory
- Predictions are similar to the simple model except...
- ...inflationary expectations lead to "jumps" in prices, interest rates and exchange rates — more volatility
- Problems with expectations lead to nominal anchors and targets
  - Exchange rate targets
  - Money supply targets
  - Inflation targets